

Digital Media, July 1991

TABLE OF CONTENTS (full-length articles below)

FEATURES

- **CD-I Has a Rough Row to Hoe.**

One thing you can say for sure about CD-I: everybody's got an opinion about it, and they don't keep their voices down. When Philips first announced the idea for CD-I at Microsoft's CD-ROM Conference in 1986, the prospect of an interactive disc player for less than \$1,000—which would do no less than launch a revolution in home entertainment and education—was pretty enticing. More than five years later, enthusiasm has cooled a tad. But titles funded by Philips subsidiary American Interactive Media are still under hot-and-heavy development. Can CD-I keep the titles ball rolling, and will consumers jump at the chance to interact with their TVs? Good questions.

- **Digital Movies: Who Will Get There First?**

The promise of getting Hollywood to adopt digital technology for video distribution causes visions of sugar plums to dance in the heads of those who've tracked the explosive growth of the CD audio business. Despite some hefty obstacles, many people believe that no true market for interactive anything will be a reality until we get movies on disc—and boxes to play them—into the homes of consumers. Consumer electronics firms, cable TV and Ma Bell, satellite services and movie studios are each trying to get there first. It's the pivotal media battle of the 1990s.

- **'They Said It at Digital World'**

It's almost impossible to summarize three intensive days of sessions from this year's Digital World conference in Beverly Hills. This small but mighty recap attempts to hit a few of the high points. Thought-provoking comments are included from the likes of Jim Clark of Silicon Graphics on consumer players and U.S. District Court Judge Stephen Wilson on intellectual property rights in the coming decade.

I/O (reader feedback)

- **Is Mini Disc the end of the 'personal boat anchor'?**

A reader imagines the possibilities.

NEWS

- **Frox debuts at CES**

The long-awaited interactive entertainment system is not yet for the masses.

- **IBM's new 3.5-inch optical drive**

Will the computer industry—including Apple—buy it?

- **Bohrman leaves InterActive**
He's unhappy with the ABC News unit's new direction.
- **Cable sniffs at digital TV**
How to broadcast digital media was the focus of Reno cable engineers conference.
- **Video editors cut broad swath**
Digital World exhibits a vast array of contending products.
- **Ethernet over cable TV**
DEC shapes a community multimedia network over coax.
- **Mediascape**
It's DCC v. DAT v. Mini Disc: a 3-way race for audio standards.
- **I/O (reader feedback)**
Is Mini Disc the end of the 'personal boat anchor'?
A reader imagines the possibilities.

ARTICLES

IS CD-I ALREADY A FLOP?

Despite serious errors in judgment, it's too soon to tell

Jan Timmer, chairman of Philips Industries, certainly cannot be faulted for lack of vision. Though most of us can't hope for more than one big, good idea in a lifetime, the man who made his career launching the compact disc revolution had Vision No. 2 more than six years ago. He saw great potential for a CD-based consumer electronics device that would bring interactive programming into the home and turn people's attentions away from the miserable offerings of the ubiquitous idiot box.

Wagging tongues. As a result, Compact Disc-Interactive (CD-I) is today a well-worn phrase that industry wags roll off their tongues with a knowing, haughty chuckle. But like it or not, CD-I was the buzz of the Consumer Electronics Show in Chicago, and Philips Industries—purveyor of the product that's supposed to revolutionize consumer electronics—has promised that the first CD-I retail units will finally be shipped in October 1991.

The easy bet to place is that CD-I will be more fizzle than sizzle. Philips and its CD-I software subsidiary, American Interactive Media (AIM), have asked us all to suspend our disbelief about CD-I for longer than most of us have been willing to bear. Though initially excited, many of us started feeling burned by the endless hype.

Not holding our breath. The specifications were first announced five years ago, in May 1986, at Microsoft's International CD-ROM Conference in Seattle. CD-I was to be released in 1987. But it wasn't—the first fully functional version of the spec wasn't even ready until November of 1988—and still hasn't been. Philips also said CD-I would cost less than \$1,000, the magical price

point for success in the home market. Today its list price is \$1,400. It was also going to have full-motion, full-screen digital video capabilities built in, but now digital video will be optional—at a price still undisclosed by Philips.

Many people who've been holding their breath for this product finally turned blue and passed out. When they came to, they started looking elsewhere for the Multimedia Player That Would Change the World.

It's not unusual. Bernie Luskin, president of AIM in Los Angeles, insists that CD-I isn't late—that perception, he says, is a result of “uninformed expectations.”

In fairness, this lengthy a gestation period is hardly unusual for a new hardware platform, even one that's based on an old, weird chip (a 16-bit, 10-MHz Signetics 68070, a superset of the 8-bit Motorola 6809), 1 MB of RAM and CD-RTOS (for CD Real-Time Operating System), also old and proprietary, and first developed about a decade ago by Microware of Des Moines, Iowa.

The hangups mostly hinged on the very new problems of integrating media types—video, graphics and sound—and getting them to run in some kind of synchronized fashion via a CD drive's pathetic data rate. Encoding schemes for color, video and audio information were known prior to CD-I, but there was no custom silicon to implement them. Philips had to do that as well—a fairly rigorous piece of work that stole a hefty chunk of time in the process.

Kvetch away, but it *is* a standard

So today everybody is kvetching about CD-I. It's too late, it's too expensive, it doesn't “do” full-motion video, it's slow, it's hard to develop for, the titles are boring, and Nintendo's already in the home.

It's heeeere. But Timmer's idea was to do one thing that everyone says this industry needs, and that Philips has proven it does exceptionally well—set a standard, and an international standard at that, for an interactive device that would play any standard CD made anywhere in the world.

Philips did this by devising a specification now known as the Green Book, with Sony's collaboration (though Matsushita was along for the ride), which went much farther than simply mapping out the “I” in CD-I. It was constructed so that all of today's standard CDs worldwide would be able to play in the CD-I box—everything from audio CDs to CD-based games to CD-ROM/XA and, more recently, Kodak's new Photo CD.

The box was thus designed as a component, and anyone who wanted to could get a Green Book and build one, thus helping “commoditize” the technology. In fact, many Japanese companies have CD-I players in development.

A little worrisome. One thing of concern, however, is Philips's MPEG chip deal with C-Cube Microsystems, announced at CES, to provide the MPEG full-screen, full-motion video decompression module for CD-I. (Without it, CD-I can only display a small portion of a screen of video at less than the requisite 30 frames per second.)

Philips won't talk about how much it will cost—a big concern to developers who need consumers to make an extra purchase to take advantage of full-mo. “It has to be reasonable,” Jerry

Calabrese, VP of CD-I marketing for Philips, acknowledges. “We’re not going to do something dumb. We’ve got a lot invested in CD-I.” But many think it’s a big mistake to ship the first CD-I players without it.

In addition, C-Cube’s first big design win, in the Next Computer System, backfired when C-Cube couldn’t satisfy Steve Jobs with a stable enough chip. It’s doubtful, given the difficulty of getting robust decompression onto a chip, that Philips will be able to meet its fourth-quarter ship date for the video module.

Stellar design. Often overlooked in the feeding frenzy of criticism is the design of the CD-I box itself, at least the Magnavox-labeled player Philips was demonstrating at CES. Making it the same size and color (black) as a standard stereo component was obviously important, but the control device on a player with “interactive” in its name was key.

Since remote devices are today the closest that consumers get to “interactivity” with their TVs, such controls for interactive players are a critical juncture point. The control device shown with the Magnavox CD-I player is elegant, small and easy to hang onto.

As seen in the photo at left, the remote uses a small joystick to maneuver the cursor around the screen. Buttons surrounding it function as selectors; switches for TV and CD-I, play, pause, stop and volume control are absolutely obvious.

They’ve got the fever. Another critical piece of the puzzle, which Timmer *et al.* learned from CD audio, was the importance of titles.

When Philips decided CD audio was the greatest thing since sliced bread, it was not a far reach for it to tap its PolyGram music label and say, “Convert your archives to CD; let us worry about marketing them.” Skeptical audiophiles, faced with a massive library of titles on a new medium, weren’t hard to convince after they gave a listen.

But there is no equivalent of the audio fanatic, or a massive library of anything, in the interactive media business, so it was up to Philips to create a new titles market from scratch. It attempted to do this by founding AIM (and sister companies in Europe and Japan), chartered to build a titles base for CD-I. What Philips did right by founding AIM, it also did wrong by how it set up the organization.

Where AIM went awry

It’s a nasty business, this pioneering. Through no real fault of its own, other than impatience to start the ball rolling, AIM started pitching the CD-I platform to developers without any real tools to help them. Horror stories abound; many developers attest to having spent most of their time (with money from AIM keeping their companies afloat) creating the tools to create the titles.

Every producer I spoke with said that until about six months ago, this was absolutely true, though Luskin insists it isn’t so. What changed in that period of time was the availability of a new compiler from Microware, and the acquisition of a tools company called OptImage (more on them later).

Artistic control. In addition to a dearth of tools, AIM has suffered (and suffers) from its demand for a high degree of control over the end result. Scripts and projects were reviewed to the nth degree by all levels of AIM bureaucracy (which one wag said made the French government seem like a paragon of efficiency); as a result, many producers found their projects unconscionably delayed by anywhere from one to two years.

In addition, its boilerplate contract actually gave AIM the right to pull a project at any time and give it to another developer, the equivalent of taking Super Mario Brothers from Nintendo and letting Sega finish it. Luskin says this degree of control was necessary with many developers who had no experience creating image-and-sound-based applications, and was not the case with “key developers we felt we could trust.”

But even experienced AIM-funded developers often found themselves and the minute details of their projects under intense scrutiny from many layers of AIM bureaucracy. Some developers indeed left the fold, disgusted; others had their projects pulled. Luskin says AIM only rejected “inadequately or ineptly presented” proposals, creating what he called “consternation” among some in the developer community.

In perpetuity throughout the universe. Other clauses in AIM’s boilerplate are equally less than inspirational, requiring that developers relinquish all optical-disc publishing rights to AIM “in perpetuity throughout the universe”—meaning that AIM need never pay a dime of royalties on any CD-based version of a title, whether 100 or 100,000 are sold.

Of course, such clauses are subject to debate and change, but inside sources confirm that many small developers were either too naive or too broke to invest \$5,000 or \$6,000 in hiring a good entertainment rights attorney to negotiate their contracts.

Not all developers think AIM cuts a bad deal. Luskin estimates an average title probably costs between \$200,000 and \$300,000; developers say it’s hard to get outside investment money for an unproven platform.

“I certainly think AIM right now is one of the only games in town,” says one. “When another company comes in and says, ‘I’ll spend \$100 million per year developing optical media stuff,’ things will change pretty quickly. But good developers who aren’t happy about the ownership of (royalty) points are being silly.”

That scenario, by the way, may not be far off: rumors abound that Japanese consumer giant JVC is chatting up CD-I title developers.

You can’t buy love. Luskin says AIM’s up-front investment in titles has already “significantly improved” the genre. In any case, some developers who are signing on with AIM or continuing to develop products for the company are using its money as an investment in the learning curve for future products they can develop without AIM’s financial support. Keep this in mind when you see the first generation of CD-I titles.

What AIM's doing right

Absolute dedication to the cause. Despite setback after setback, Philips and AIM continue to spend massive amounts of money—the conservative estimate is \$250 million—on titles development, and they are moving forward to rev the hardware.

Tools. Part of that investment has been to correct a critical weak point: tools. To that end, Philips recently purchased a company called OptImage, based near Microware in Des Moines.

OptImage's Balboa developer toolkit is a complete development package for standard-issue titles (though developers pushing the envelope, as they say, still find themselves doing some custom hacking).

Cinemaware and Garry Hare. In addition, AIM realized the long-term value to bringing some "names" in-house. AIM recently scored by hiring David Riordan, maker of fine interactive movie products under the auspices of his old company Cinemaware, after Cinemaware dissolved. He now runs an AIM division called Point of View and is busy building new CD-I titles.

Garry Hare, president of Fathom Pictures and another highly regarded developer, was recently made managing director of European Interactive Media, AIM's sister company, and will facilitate the development and distribution of titles overseas.

Nintendo, too. Philips also recently announced a surprise agreement with video game giant Nintendo, whereby Nintendo has granted Philips a license to develop and market video games on CD for Nintendo's new Super Famicom and Super NES 16-bit home video game hardware. They'll work together to develop a unique format for Nintendo, based on CD-ROM/XA.

With Philips's "backward compatibility" strategy, this means the Nintendo CD-ROM/XA games will also play on CD-I. AIM also licensed Nintendo characters such as the Super Mario Brothers and will develop and market CD-I titles based on them. This was a smart move—video games are an obvious impetus for a multipurpose home electronics purchase.

Titles. For those who believe that a massive archive of titles is what will drive the market, AIM has funded interactive products in subject categories from art to gardening to music lessons to children's educational entertainment. "Big name" developers include Rand McNally, Time-Life Books, The Smithsonian Institute, Children's Television Workshop and ABC's Wide World of Golf. Most people agree that 50 titles will be ready when CD-I is released in the fourth quarter.

Too soon to say

Those of us on the inside looking out may be too jaded to know a good title when we see one, though I saw nothing in the Philips display at CES that would make me run out and buy a CD-I player in October.

But during a panel called "Where are the markets?" at last month's Digital World conference in Beverly Hills, there was general consensus that the "killer application" was a windmill that was probably best left for the computer industry to tilt at, or for those who have lucre-filled fantasies of some player, somewhere, that could repeat the (relatively) instant success of CD audio.

Blind men and elephants. Larry Lowe, a former applications design engineer at AIM, says public perception of CD-I is like the fable of the seven blind men and the elephant: each believes that whatever he grabs—the tail, the ears, the leg—defines the beast. In the same way, the variety of CD-I products makes it impossible to pigeonhole, or to forecast its future.

There are two obvious bottom lines. One is whether dealers will believe in the concept and/or understand it enough to stock CD-I players on their shelves. (By CES, more than 2,000 dealers had agreed to stock CD-I players and titles.) Even more important is whether consumers will believe there is some added value in being able to “talk back” to their televisions. For the sake of everyone who wants this business to move ahead, we’d better hope the answer is “yes.”

But it’s vital to keep in mind that CD-I will not be an immediate, runaway success. Many factors, not the least of which is the fact that consumers don’t have a reference point when it comes to interactivity, will contribute to what’s bound to be slow growth.

Will Philips last until CD-I-2? Then there’s the question of whether the lack of motion video decompression and titles that, to date, are underwhelming will be fatal to CD-I. Will there be enough CD-I fanatics, as there were Macintosh fanatics in the early days, to carry CD-I through on word of mouth until video and good titles appear? And will Philips’s financial staying power prevail until CD-I-2? It’s too soon to say.

Even if CD-I bombs, however, it won’t be the end of the world for interactive technology. It will succeed sooner or later, with either this generation of products or the one after. The challenge is to try to pinpoint what’s required to make interactive products compelling enough to move them into the mainstream. And *that* is what we’re waiting for.

Denise Caruso

THE WRONG TECHNOLOGY

We can do better than CD-I

The first-generation CD-I will not have more than *very* modest success in the market. They are expensive, and consumers will not find the titles compelling. It is possible that second- or third-generation players with full-screen, full-motion video and lower prices will be much more successful, though I am not willing to bet on it.

From a technological point of view, it would be a shame if CD-I were successful. The technology is based on an oddball and obsolete processor, a godawful operating system and too many proprietary bits.

True, the hardware could be replaced with more modern, more open hardware, but the legacy of the original hardware and the original operating system will handicap CD-I forever.

We would be *much* better served if this kind of product were based on computer hardware and software that is shared with the mainstream computer industry. This would allow consumer products to benefit from the title-development tools available in the computer industry, and both industries could benefit from common advances in hardware and software technology.

In the end, despite Philips's commitment to the project, and despite support from many Japanese companies, I will be surprised if CD-I is the next hot consumer product. The technology is not quite ready. The market is not ready. Besides, technically speaking, we can do a lot better.

— Jonathan Seybold

DIGITAL MOVIES ARE ON THE WAY

Who gets there first is the 1990s' pivotal media battle

The race is on. Consumer electronics companies, cable TV companies and direct-broadcast satellite companies are all gearing to deliver digitally encoded movies to the home—while the telephone operating companies join partnerships to avoid being left at the starting gate.

Has everything. As they say in Hollywood, this story “has everything.”

- It will set the standard for the next generation of physical media: high-density compact discs.
- It will establish transmission of high-bandwidth digital data into the home.
- It will most likely have first call on consumer spending for electronic gear (a sobering thought for people trying to establish a consumer market for interactive multimedia products).
- It will bring the consumer electronics companies, the cable industry and satellite entrepreneurs into direct confrontation—with movie studios in a pivotal position in the middle. (Do not forget, however, that two of the major studios are now owned by consumer electronics companies.)
- It is certain to raise sticky copyright, intellectual property and copy-protection issues.

Who needs it?

The consumer. The new compressed digital video technology could raise picture quality on current NTSC and PAL receivers to something closer to the quality of broadcast studio monitors—a striking improvement over both VHS tape quality and what most people now receive over the air or down the cable wire.

Consumer electronics firms. For consumer electronics companies, a new generation of compact discs and CD players should provide a much-needed boost. The consumer electronics industry is driven by finding new technologies to create new waves of demand.

Direct broadcast satellite entrepreneurs. For direct broadcast satellite entrepreneurs, on-demand delivery of movies to the home is the pivotal service that will attract consumers to a new television service—and the number of channels required to provide this service is practical only with digital technology.

Cable operators, too. But cable operators are also entranced with providing much the same kind of service. For them, “pay-per-view” delivery of movies and special events appears to be the best chance they have of increasing their revenues now that growth in new connections has leveled off and local governments are increasingly reluctant to grant cable rate increases.

“Pay-per-view” works best when cable operators can offer *lots* of channels (so that they can provide a wide choice of movies and starting times). Again, digital is the way to go.

Don't forget movie studios. Finally, movie studios are well aware that total receipts from video rental of movies now outpace box office receipts. A pay-per-view system could allow the studios to collect a fee from each home viewer, just as it does from each theater attendee.

Movies are the key

For everyone concerned, movies are the key. Movies are what built the video tape industry. Movies are the backbone of most cable programming. Movies are almost certain to be what drives the next video revolution.

MPEG. The factor that has brought all this into focus over the past year has been the rapid evolution of the Moving Pictures Experts Group standard for digital video compression. The MPEG standard is now virtually certain to be the digital encoding scheme used for recording movies on CD. It is likely to be used for most cable and direct-broadcast satellite systems as well.

Video on audio CDs. Most of the effort thus far has been focused on compressing digitized NTSC or PAL video sufficiently to fit onto the current generation of compact discs. This means that there is approximately 1.2 Mbits/second to convey full 30-frame-per-second NTSC or 25-fps PAL video—which requires something more than 100:1 data compression!

Like all high-compression procedures, MPEG is a “lossy” compression scheme—the more you compress a video stream, the more quality you lose. At low levels of compression, the loss is undetectable. At very high levels, you lose color definition, sharpness and smooth frame-to-frame motion.

The quality of 100:1 MPEG compressed video has improved enormously the past year. Even so, almost no one believes that it will ever be mistaken for original studio-monitor broadcast quality. The consensus is that you should expect an image equivalent to VHS quality.

Needed: improved quality. This is certainly adequate for interactive multimedia applications such as CD-I. But it does not provide any incentive for consumers to abandon VHS tape as the preferred medium for movies. This would take a *significant* improvement in quality—which can be achieved easily by moving to a new generation of high-density CDs that have, say, two or four times the data storage of current CDs and appropriately higher data transfer rates.

High-density CDs could be completely backward compatible with existing audio CDs. They could be a real boon for read-only computer storage and for interactive multimedia.

Cable delivery. The same compression techniques and the same data rates would work equally well for delivery of movies over cable. Moving to digital transmission would also allow cable operators to deliver higher-quality video to subscribers. Far more important from the cable operators' point of view, it would allow them to send several times as many channels over existing coax wires—and *many* times as many signals over fiber-optic cabling.

This ability, coupled with the ease of scrambling and de-scrambling digital signals, makes possible multiple copies of the same movies with staggered start times. Viewers who want to see a movie will no longer have to go to the video store to rent it. They will be able to select it from a

menu presented on their screens, and wait a few minutes for the next start time. They will be charged via their monthly cable bill.

Direct broadcast satellite. This is exactly the same scenario envisaged by companies such as Sky Pix that propose to bring on-demand movies to the home via direct broadcast satellite. Although Sky Pix is proposing to use a simpler compression scheme than MPEG, anyone starting to plan for such a service now would surely choose the MPEG route instead.

The race is on

The threat of competition from direct broadcast satellite services is a powerful spur for cable operators to move as rapidly as possible—and vice versa.

Both would like to make significant inroads into the video rental business. Both will try to convince the movie studios that this could be an important new source of revenue for them as well. Meanwhile, the consumer electronics giants are racing to come up with a new and better medium for video sale and rental.

We will be exploring different aspects of this confrontation over the coming months and years: video compression technology, developments in cable and direct broadcast satellite, the role of the telephone companies, high-density CD technology, and so forth. In fact, the August issue will detail a proposal by Sun Microsystems' VP of technology, Andy Bechtolsheim, which drew an enthusiastic response at this year's Digital World conference.

What about HDTV?

Analog high-density television (HDTV) was supposed to be the technology that would sweep the consumer electronics industry forward into the next century. Many people in Japan and Europe still believe that it is. However, it is now apparent that HDTV is a number of years off in the U.S.—and when it comes it will be digital, not analog.

The Japanese have tried for years to “jump start” analog HD. As mentioned in the June issue of *Digital Media*, the Europeans are now trying to do the same. Thomson and Philips agreed last year to invest a total of \$3.2 billion in the project. Last month, the European Commission allowed the French government to give Thomson another \$430 million to help cover its share. This will bring the total, direct HDTV subsidy to Thomson to a half-billion dollars.

Digital is faster and easier. But HD of any sort is going to be expensive for many years to come. And, because it requires so much bandwidth, analog HD is going to be difficult to transmit over the air, over cable, or via satellite. Digital implementation of standard, “low-definition: television is likely to come much more quickly and much more easily.

Even better would be digital “medium-definition” TV, part of Andy Bechtolsheim's proposal that you'll read about next month. In his speech to the Digital World Conference, Bechtolsheim proposed a wide screen format for digital movies, which could be easily implemented and which could coexist with current NTSC and PAL TV. We will have more of the details in our next issue.

—Jonathan Seybold

‘THEY SAID IT AT ‘DIGITAL WORLD’

A small, but mighty, recap of the June conference

The number and intensity of sessions at last month’s Digital World conference in Beverly Hills makes it impossible to summarize them in any detail. But many speakers had thoughtful comments to make about the state of digital media-based computing and products, and what follows are a smattering of those comments.

In the opening panel, Jim Clark, chairman of Silicon Graphics, revealed that his company is cooperating with Japanese partners on development of vastly powerful processors based on the MIPS Computer Systems RISC architecture. With a performance of 300-500 million floating-point operations per second (which Clark believes will be available in the next 3-5 years), these chips would eliminate the need for custom silicon to handle tasks such as digital video compression and decompression. They would become the fundamental hardware needed to handle the integration of many media, including synthetic 3D realistic image creation and manipulation and the sampling of digital video and sound.

“All media manipulation could be handled on one single, general-purpose, highly programmable processor,” Clark said.

Compatibility between consumer and computer. Clark believes that the same processors, using the same instructions and able to run the same programs, will be used in both consumer electronics products (such as digital cable TV decoders) and computer workstations. A consumer player might use a single chip, while a workstation would likely use many processors operating in parallel. The result would be compatibility between computer and consumer platforms.

In addition, the cost of developing and producing this chip could be leveraged by the mass production required for successful consumer devices.

In the Japanese Connection panel, Jack Plimpton of Japan Entry explicated the differences in business styles between Japanese and U.S. companies. He said that the metaphor for business in the U.S. is that of a “game,” while the metaphor in Japan is “war.” Some U.S. companies—Microsoft and Intel (and, we would add, Disney)—share the megalomania that Plimpton says characterizes successful Japanese companies, though these companies are routinely criticized for taking such a perspective.

Shunsuke Matsuda of Mitsubishi suggested that, for their vaunted homogeneity, the Japanese are culturally tolerant of ambiguity and diversity in “standards.” They are, he said, quite comfortable using Taoist, Christian, and Buddhist ceremonies for personal occasions.

Tolerance for multiples. This may explain their tolerance for multiple standards in their personal computers as well (in the Japanese market, nearly all manufacturers require specialized system software for their PCs). It helps to explain why they are less troubled than Americans by multiple media standards (Beta, VHS, CD, CD-I, DAT, MD, DCC, etc.). Japanese consumers, who love gadgets, are far more willing than Americans to take a chance on new technologies. Americans, on the other hand, are reluctant to get stuck with 8-track tapes and tape players or Beta equipment.

It was further noted in the “Where are the Markets?” session, by Michael Schrage of the Los Angeles *Times*, that “American companies *hate* low-margin businesses. . . . [They] love niches, they love monopolies.” They also shun “commodity” businesses which demand finely tuned operating practices.” The Japanese, on the other hand, are happy to compete in these fields. For example, a Japanese company is typically satisfied with a 3 to 4 percent margin on its products, while American companies will call it quits if the margin falls below 10 percent. This assures us that mass-market products will continue to be developed by the Japanese unless U.S. businesses begin to embrace truly open architectures.

Trip Hawkins of Electronic Arts (a \$100-million-per-year game producer) gave some notable commentary about the American home and the markets that exist around it. First, he proposed that the market for home technology could be as much as \$20-40 billion annually, considering that \$14 billion was spent on video rentals in the U.S. alone last year. Movies by themselves are a significant market ready to be plundered by a new, convenient technology.

Computers are still too expensive. Hawkins then pointed out that \$7 billion was spent in game arcades—\$7 billion in quarters spent on video games, pinball and mechanical bowling. Why then, he asked, is the home game market only a \$2-billion-per-year industry?

The obstacles are clear: computer technology is too expensive and current game technology is not sophisticated enough to support interactivity with complex graphics. Compression could assist, but Hawkins expressed doubts about the vitality of MPEG. “Is MPEG good enough? If Hollywood doesn’t think it’s good enough and they’re not going to get behind it, then let’s not waste our time on it,” he said. Hawkins believes that when suitable, inexpensive technology comes to the home, the market for home entertainment will steal from and surpass both the rental and arcade markets.

Howard Mirowitz of Mitsubishi pointed out that the first 30 percent of market development is where all of the interesting stuff happens. Early technology development is determined by “a bunch of crazy people inventing the basic technology while eating pizza and drowning in Jolt Cola.”

The hockey stick curve. A number of these projects are funded, bringing numerous incompatible architectures to market. There follows a period of “evangelical confusion” where many platform vendors are fighting to control the market by being first.

Eventually, Mirowitz said, one or two develop enough of a base that the market begins to take off in a “hockey stick” shaped curve. Standards are thereby set, clones are developed—and investors lose interest because the game is over. This, he said, is how standards are set, not by committee.

Following the Intellectual Property Mock Trial, which pitted a movie studio against an alleged thief of a movie clip for use in an interactive product, U.S. District Court Judge Stephen Wilson addressed the means by which intellectual property rights will be established over the coming years.

It's important to remember, he said, that disputes over high-technology issues will be settled by juries of lay people. The system as it exists today was established so that juries decide cases based on credibility.

A trial such as the one presented at the conference is asking the jury to decide on fine nuances of the law, which Wilson felt is not what the system was designed to handle. One school of thought in the courts even says that certain cases are so complex that they ought not go to a jury at all. Even this view presumes that judges themselves are capable of handling such cases.

Unsophisticated juries. Wilson urges business people and their lawyers to keep in mind their "audience" in arguing such cases. The issues must be simplified as much as possible. Such cases will be resolved by people with far less sophistication than the participants.

The other point made by participants in the Mock Trial was that until Congress creates new laws governing electronic rights, such cases will be decided on established standards of law *even if they are not entirely appropriate to the medium*. Nobody expects Congress to act on such issues in the foreseeable future.

(This sentiment flies in the face of the opinion of Laurence Tribe, the Harvard Law School professor who has proposed a 27th Amendment to the U.S. Constitution stating that the fundamentals of the Constitution should be applied "without regard to the technological method or medium through which information content is generated, stored, altered, transmitted or controlled." Tribe believes the Constitution is sufficiently elastic to protect our rights. What's really required, instead of a new body of arcane laws about digital media, is more education about the issues themselves.)

Take it case by case. The other option in establishing standards of law is to develop a body of court cases that deals directly with such issues. This implies, however, that there will be a number of expensive and time-consuming trials, decided case by case, before there are universally understood legal practices.

Ken Liebman, one of the "trial" attorneys, said that such lawsuits would be a good sign for the industry because "you only have lawsuits when there is a lot of money at stake, which means there is a market. If you do see a lot of lawsuits, we know that you are successful." Spoken like a true lawyer.

— Jonathan Seybold, David Baron

I/O: READERS RESPOND

Mini Disc peripheral: end of the 'personal boat anchor'?

*Jim Teter, President
Management Graphics, Inc.*

The recent introduction of the Music Walkman and its Mini Disc by Sony can bring the pieces of the personal computer industry together at last. Personal computers are moving from being desktop personal boat anchors to laptops and notebooks—in other words, intimate computers.

Joining computers, consumers. The use of this small, high-capacity storage device, a disk that would use the same size drive as the current floppy disks, can create a critical connection between personal computers and consumer electronics, a trend that is happening already.

The Sony Mini Disc specifications, as I understand them, include a 2 1/2-inch plastic casing like a mini-floppy, 150-160 Mbytes unformatted, 120 Mbytes formatted, 74 minutes of music with a new encoding scheme, about the same amount of music available on music CDs now, 1.4 Mbits per second transfer rate, and a new laser head design allowing one drive to accomplish two important tasks: read CD-ROM technology disks and read and write new magneto-optical (MO) disks, which require 1/4 the energy to write as older MO technology.

Video isn't everything. The announced and obvious advantages are low power consumption and small size, making this technology perfectly suited for portable applications. Some people at the Digital World conference last month were less excited about the product because of the fact that Mini Disc technology does not allow for real-time full-motion video and that it has less digital storage capacity than CD-ROM.

But instead of bemoaning the Mini Disc, look at it as an audio tape killer in the music world and a floppy disk killer in the computer world. The portable size of the Mini Disc coupled with the 120-Mbyte storage capacity could, and in my opinion should, mean the end of floppy disks.

Put it everywhere. I believe the Sony Mini Disc should be incorporated in every personal computer and workstation, as well as consumer devices like the Music Walkman, and some future "Digital Photo Album"-type product. All such devices should be able to read directory information off the disks, and read and write appropriately; thus, a computer disk is never inadvertently corrupted on a Music Walkman recorder.

Imagine if every Intel/Microsoft/IBM PC, every Macintosh, every Sparcstation, etc. had this drive technology standard, and if that technology was formatted in such a way that audio Mini Discs could be inserted, recognized, and played.

Imagine this

Imagine if QuickTime extensions for the Macintosh could write these Mini Discs so they could be played on any Music Walkman.

Imagine if Canon, Minolta, Nikon, could build their forthcoming digital still cameras to write these disks so that the digital photos could be read into computers.

And imagine if MIDI-compatible music machines could read and write these discs.

A personal database. Some other uses come to mind as well. For business, professional and consumer use, publication of lectures, business and personal development programs, internal corporate-specific and private audio communications could all utilize the Mini Disc. Both the mass market and the local/niche market would be served. Fax reception and storage could be accomplished with an on-the-road portable computer. For many people, one disc could be their entire personal database. Publishing digital books, manuals, and newsletters, as well as digital photo albums, on these disks will be easy. And remember, if it is digital, it can go over phone lines.

The Mini Disc could also revolutionize software distribution. Thinking traditionally, one disc could be all you need to ship PC or Macintosh software. Thinking radically, PC, Macintosh, and other platform versions of software could be put on the same disc with a common data structure for the program; that way, you could operate your product on almost any computer from the same disc.

Hoist the boat anchors. Finally, I think the notebook-size computers are the first true Personal [sic] computers. At a conference like Digital World, instead of having all those personal boat-anchor computers on the podium to run people's demonstrations, each person could approach the lectern with notebook computers in hand, insert their Sony Mini Disc, clip them into the circuit, and make a great presentation. This would be more convenient than a slide tray or Macintosh with an operator.

This would change the world:

- In one fell swoop, the problem that plagues CD-ROM drives, that of small market penetration, would be wiped out. Mini Discs would be everywhere—a standard.
- The notebook computer would become an indispensable business tool.
- The meeting of the computer and consumer electronics industries would occur.

What about IBM? The IBM read/write optical disc is an alternative, but is it a good one? Probably not for me. I want the music connection. I want portability. I am very happy to see IBM become a player in read/write optical discs, but the 3.5-inch disc format is too large and, from what I have heard, too thick.

NEWS

FroxSystem debuts at CES

It's pricey, but hey—what's another \$10,000?

After more than three years and \$17.5 million in private investments, Frox Inc. is preparing to ship the first units of its long-awaited interactive home entertainment center some time before Christmas.

Based on high-end digital and computer technologies, the FroxSystem was unveiled during private showings for dealers at the June Consumer Electronics Show. Company officials say response to the \$10,000 system was positive—they signed up 120 dealers on the spot, happily more than the 108 they'd targeted.

In fact, they say, Frox's Seattle dealer has already sold out his quota of 10 systems. Frox president Austin Vanchieri claims that Microsoft chairman Bill Gates ordered the dealer's entire block of FroxSystems for himself and other Microsoft executives.

Silicon Valley history. Frox has an interesting history, parts of which some readers may know. The company was founded in 1986 by Hartmut Esslinger, founder of the award-winning industrial design firm Frogdesign in Menlo Park, California. Esslinger's firm designed the look of the Next machine, Sun Microsystems' Sparcstation and many of Apple Computer's products.

Andy Hertzfeld, one of the original designers of the Macintosh and principal designer of the Mac's system software (now working under a cloak of secrecy at General Magic, supposedly on a consumer communications device), wrote the original operating system for Frox. But at the end of 1989, both Esslinger and Hertzfeld left Frox. Hertzfeld took with him the rights for the Macintosh version of the OS.

Hertzfeld lives on. Though Vanchieri says Frox used none of either Esslinger's hardware design or Hertzfeld's user interface and operating system, in fact substantial and important pieces of Hertzfeld's work remain. (We know this because Hertzfeld did an extensive demo of his version of his Frox OS at a recent meeting of the Software Entrepreneurs Forum in Palo Alto.)

A four-part system. The FroxSystem consists of four main parts: FroxVision, FroxSound, FroxControl and FroxCast.

Vision with a Sparc. FroxVision consists of a video preprocessor, a media processor and three types of monitors: a 31-inch direct-view monitor, which looks like a regular TV screen, a 51-inch rear-projection big screen, and a 10-foot front-projection screen for true "home theater" applications.

Frox calls the Media Processor and the video preprocessor the "heart" of FroxVision. The hardware is based on a patented architecture that uses a Sun Microsystems Sparc RISC chip as central processor and nine custom chips that both perform picture improvement and synchronize the operation of 2 to 16 digital signal processors (DSP) for audio quality.

Software consists of a graphical user interface that the viewer navigates to control everything from color to picture quality to program and device selection to hooking up new components as they become available and/or worth the effort. And yes, it's easy to program your VCR with Frox—just select the program from an on-screen listing and drag it to a VCR icon on the control panel.

Bring on the digital TV. The video preprocessor pulls in and digitizes a standard NTSC signal, then uses all-digital processing on the picture to improve color, acuity and resolution, and to remove motion artifacts and lines. The result is a very high-quality picture—not quite HDTV quality, but certainly head-and-shoulders above anything seen today, even on Super VHS.

Vanchieri says the system won't be obsolete when digital TV and movies start to hit. "We just won't have to do analog-to-digital conversion," he says. "We'll just be able to take in the digital signal directly."

Digital sound, too. FroxSound consists of an analog-digital-analog converter; optional front, rear and center channel speakers and a digital subwoofer; and an optional 100-disc CD system changer.

The sound system is based on what's called "steered logic," implemented in the DSP chips, which the company claims will provide quality "identical" to the surround-sound systems found in movie theaters. The reason, it says, is that today's home Dolby surround systems provide only three decibels of separation between front and rear speakers. FroxSound provides 21 decibels.

Don't break the glass. Though Frox can connect to a regular analog speaker system, its own speakers are fully digital, including a digital subwoofer to amplify lower-frequency sounds, such as jet engines, that aren't heard but are felt. The system is also designed to accept digital fiber input from up to 32 speakers.

In fact, the entire FroxSystem is cabled with fiber. Fiber-optic cable does carry more data faster, but since it's made of glass it can't take much physical abuse and refuses to be bent at 90-degree angles.

FroxControl. A space-age-looking remote device called the FroxWand controls the FroxSystem. Designed with a base to sit on a table, as opposed to being left on the couch where someone might sit on it, it uses a thumbstick controller to move the cursor around the screen to make selections.

One of Hertzfeld's creations, the cursor is a grasping hand that closes part-way when you reach a "live" place on the screen. A click on one of the remote's buttons finishes the selection. (Another one of Hertzfeld's ideas, which Frox says it plans to implement, is to let users select from a series of hand styles—a neat and very Andy-esque feature.)

FroxCast. Frox, in a move that vividly demonstrates the cost benefits to repackaging digital data, is also launching the FroxCast service when it ships the system. With a monthly charge similar to that of a cable company, the company will use satellite uplinks to provide a downloadable 40,000-title CD library containing the names of cuts on each title, cover art and other information; a movie library with a mini-rating system for thousands of movies; TV, cable and satellite schedules; sports reports and score updates every 20 minutes; and financial market information.

A little overwhelming. A couple pieces of equipment that are pretty key to the system—digital speakers and the 100-disc CD changer—are optional, but the company says it will provide them for less than \$400 each. That's what Vanchieri said, so hold him to it.

If you think this is all a bit too much, just wait a while. Vanchieri says the company has plans to enable adding keyboards, modems and other computerish equipment to the system. "I'd be insane to launch with it, though," he says. "When the time is right, we will."

— Denise Caruso

IBM's 3.5-INCH OPTICAL DRIVE

Back in the saddle with homegrown rewritable; will Apple buy it?

When IBM Corp. recently unveiled its latest PS/2s (the 20-MHz 386SX-based Models 35, 40 and 57, all of which are being positioned as OS/2 2.0 platforms), it also announced the availability of a new rewritable optical drive.

Part of the Apple deal? What wasn't said in the public announcement was that IBM plans to aggressively pursue the third-party market and will retail the drive to all comers. Out of the chute, it will be available to anyone whose computer has an ANSI-compliant SCSI interface.

Although IBM refused to confirm any deals in the works, one possibility that comes to mind in light of recent reports in the trade press (and did not meet with a denial when we mentioned it to IBM) is some sort of agreement with Apple Computer.

An IBM insider said that Apple is “very interested in this format” and may decide to source the drive for inclusion in future versions of the Mac.

A SCSI with XT speed. Available now, the new drive is a 3.5-inch SCSI device capable of storing up to 128 MB of data. The drive accepts either a single-sided removable magneto-optical cartridge (the read-write variety) or a read-only cartridge. It supports data transfer rates of 4.3 MB per second and sports a 66-millisecond average seek time.

Although this is only as fast as an XT-type disk drive, IBM expects it to find widespread usage in a variety of applications requiring high-capacity removable media, such as archiving, image storage and multimedia.

The drive adheres to the ANSI SCSI X3.131-1986 standard and can be installed in a variety of PS/2s, using one of two IBM SCSI host adapters. The drive lists for \$1,795, and discs will be available for \$70 a pop, or \$63 each in a 5-pack (such a deal). In addition, a \$29 installation kit is required for certain models of PS/2s.

Homegrown. At first blush, news of an IBM-supplied 3.5-inch rewritable optical drive might appear to be no great shakes, since it is undoubtedly just a repackaged version of a drive supplied by some Japanese drive manufacturer, right?

Wrong. IBM took pains to point out that the drive is 100-percent IBM designed and manufactured. With it, IBM is seeking to “get back into the manufacturing business” and “re-establish its leadership position” there. Although the 3.5-inch format isn’t yet a standard, IBM believes it is early enough into the market—and still a sufficiently influential player—to make it one.

In this light, a deal with Apple (and perhaps one or more of the leading clone makers) is even more important, since it would all but assure that the industry would sit up and take notice. IBM stressed that it plans to work with standards committees wherever possible to help establish the 3.5-inch format as a standard, but it has also learned the hard way that most standards are set by the market, not by standards-making bodies. Hence the aggressive pursuit of third-party deals.

‘Born-again’ marketing. With this announcement, IBM also takes another step along the road it set out on a year or so ago to become a “born-again” customer-driven marketing company. Gone are the days when IBM could announce a proprietary new technology and expect the market to beat a path meekly to its door.

Like most other companies facing today’s slow economy for computer-related equipment, IBM has to pay homage to the goddess of Open Computing, embracing industry standards—such as PostScript, SCSI and even the classic AT bus—like everyone else. IBM hopes to get back into the saddle again with this product and help *set* some standards for a change. It may well succeed.

Craig Cline

BOHRMAN LEAVES ABC NEWS INTERACTIVE

On the loose after disagreements about direction and staff cutbacks

ABC News InterActive executive producer David Bohrman, one of the industry's highest-profile advocates for computer-controlled videodisc applications in education, has left the ABC News unit. His position may remain vacant.

Bohrman is a familiar face to those who've tracked interactive multimedia. As front man for ABC News' intrapreneurial venture, he's debated the pros and cons of interactive education around the globe, and he's produced InterActive's award-winning videodiscs on topics ranging from war in the Middle East to the company's health series, which included a powerful disc about AIDS "starring" former U.S. Surgeon General Everett Koop.

Not a happy situation. Though still under contract to ABC, Bohrman no longer reports to the New York-based office. ABC News InterActive president and producer Bill Lord wouldn't talk about the details of Bohrman's departure, though it's obvious the parting of the ways was not mutually cheery.

"It's not nice for us or for him," says Lord, who first hired Bohrman 10 years ago to work on ABC's Nightline news program. "It's tragic that he's leaving now that we're making it."

What? No software? Bohrman himself is slightly less circumspect. "There have been several months of significant differences between me and Bill over the unit, its direction and individual decisions, and it just wasn't working any longer," says Bohrman. One example, he says, is the three-disc series on the powers of the U.S. government—which is being shipped without the rich HyperCard-based driver that made InterActive's products a powerful classroom tool for teachers.

"'Powers' is a great product as it is, but it's nowhere near as great or as deep as it could be," he says. "We've been forging some of this new territory and creating new combinations of technologies and content. For the 'Powers' series, it's a step backward."

Production-side cutbacks. Bohrman says he also took exception to the "significant cutbacks" in staffing at the unit, primarily in the production side. Lord acknowledges that the company is "concentrating on marketing right now," and he says it will continue to develop new titles at a slower pace than in 1991. "We feel comfortable with three titles a year."

Though Bohrman is still technically an employee, the pity for ABC is that he doesn't see much point in sticking around. He's kept an active role in ABC's news division—he was senior producer of ABC's Persian Gulf war coverage and has continued to serve as a news producer, acting as senior producer of Nightline, World News Tonight and special news events such as floor coverage of political conventions. In fact, his coverage of the 1988 presidential conventions led to InterActive's first disc, "The '88 Vote."

Creating the inevitable. Bohrman says he wants to stay connected to the technology he helped popularize. "We accidentally stumbled into the unique position of having done some of these products and got a sense of where they might lead," he says. "I want to help invent some of this future, help create some of these things that are inevitable and that we know are coming."

News of Bohrman's departure came just two weeks before InterActive announced a collaborative agreement with IBM to develop DOS-based software versions, using the newest version of IBM's LinkWay hypertext software. Software front ends to the products are being developed by a third party, Media Design, an IBM business partner. Prototypes for six IBM-based InterActive titles were demonstrated at the National Educational Computing Conference in Phoenix last month.

– Denise Caruso

CABLE SNIFFS AT GOING DIGITAL

Digital media delivery 'the' topic at cable engineers conference

The cable television industry's poor-cousin relationship to digital media changed dramatically over the past year. The major industry hardware supplier, General Instruments, startled the Federal Communications Commission, the broadcast industry and television manufacturers alike by proposing a complete high-resolution digital video standard that fit the standard bandwidth. As a direct result of General Instruments' intervention, most of the proposed high-definition TV standards being tested by the FCC are digital.

At the recent National Cable Television Association Conference in New Orleans, General Instruments announced a product called DigiCable that carries digitized NTSC over coaxial cable or fiber. More important, the compression algorithm allowed an operator to have five regular NTSC channels over one channel. The industry buzzed with dreams of 300-channel systems, and Time Warner subsequently announced a 125-channel pilot system for Queens, New York.

How did they do it? At the annual meeting of the Society of Cable Television Engineers (SCTE) held in mid-June in Reno, General Instruments brought one of the three DigiCable systems to the exhibit floor. Robert Rust, vice president of new business development for the firm's Video Cipher division, discussed the compression technologies used to obtain their results and the market drive of the product's development.

Part of that drive was to provide the premium cable channels, such as HBO, 3-to-1 compression via satellite link to give a distinctive product to their subscribers.

Testing and tweaking. Many at the SCTE felt that the ability to provide clean digital signals at NTSC resolution was quite enough. There still is no proof that substantially higher resolution will be important to regular noninteractive TV watchers. Much of the conference was taken up with means of testing and tweaking the present coaxial-based system to get clean signals.

People from the telecommunications and computer worlds have heard similar issues discussed at telephony conferences for years, and the lines are still noisy there, too. Neither the cable nor the telephone industry handles digital data well, as anyone who wants a 9,600-baud modem to work over regular telephone lines can attest. Digital Equipment (DEC), which has been testing Ethernet modems within an NTSC bandwidth channel in a number of cable plants (see story, page 17), runs at only 10 megabits per second, not the 30 megabits that's possible, due to noise.

Cable plays catch-up. The cable industry knows it is playing catch-up in customer perceptions of who can provide high bandwidth, broad-based digital services. It realizes it must do what the regional Bell Operating Companies have only recently done—hire and train data technicians, a very different breed from your traditional cable or telephone installer.

Thomas Staniec, chief engineer of NewChannels Corp., which has been providing alternative data service over cable channels for years, says insuring that such technicians are ready and available is the single most important selling point with major corporations.

The cable industry is mildly optimistic that it can play a major role in the rollout of digital media to the home. Its firms realize they have little experience with business customers. They know that they are not as sophisticated as the phone companies in switching and billing. They also have to learn how to cooperate in providing services throughout a region, since most franchises are provided within municipalities. Interconnections between cable companies, such as the one between Gill and Viacom in the San Francisco Bay Area, are a prototype of how this might happen. It has two to three channels connected over 35 different cable systems.

Bandwidth by the month. But this game is just beginning. The phone companies' own projections show only a two percent penetration of Integrated Services Digital Networks (ISDN) by 1995, mostly to businesses. The cable companies already have coaxial cable to the home, not just twisted pair. They realize that fast packet switching is coming and will be much cheaper than the cumbersome digital/analog switches dominating the telco landscape. They have 10,000 headends, roughly analogous to the telco Central Office, routing signals to subscribers—seven times more than the number of central offices. They think it's possible to charge for access to bandwidth by the month, as opposed to the type of measured message services the phone company provides.

The cable companies do seem to need additional expertise, probably from telecommunications or computer companies, in order to be real players in the interactive, high-bandwidth digital media business. The conference was full of rumors about some potential deals—including Time Warner co-venturing with Toshiba, and Cox Cable joining with the Japanese international carrier KDD in the purchase of Merrill Lynch's Teleport.

Cable systems, services and broadcasters will be players in the digital media world. Ignore them at your peril.

Thomas Hargadon

VIDEO EDITORS CUT A BROAD SWATH

Products run the gamut at Digital World and beyond

The term "video editing" is much tossed around in the world of digital media, but only the cognoscenti or the innately curious know there is a vast range of products and configurations included in the term.

New video editing products shown at the Digital World conference in June allow desktop computer users, by definition, to digitize, store, and manipulate motion video. But each tool

targets an appropriate user, delivering different capabilities to the home, the office and the professional video suite.

Compression to the people. The emerging generation of “moving JPEG” video compression and decompression chips and software performs motion video capture and display in real time from a video camera or video tape recorder. Aided by media integration software, such as Apple Computer’s new QuickTime extensions to System 7, video compression will enable significant chunks of motion video footage, with synchronized audio, to be stored on magnetic or optical computer disks and to be accessed randomly for editing.

DiVA’s VideoShop software (\$595), which will be shipped at the same time as QuickTime, can display video clips on a Mac as moving-image thumbnails called “micons.” These micons can be rearranged in time and space to create a presentation sequence or “playout,” or a clip catalog. (Picture a slide sorter in which each “slide” is a motion video sequence).

Video networking for the office. Fluent Machines’ Fluency package (VSA-1000 AT-compatible board, \$3,995, and Fluent Streams software, \$495) can capture, compress and display multiple motion video/audio sequences in real time on a DOS/Windows AT-bus system. Each video window scales up or down automatically, based on what hardware is local to the receiver’s machine, and the digital video is designed to be transmitted effectively over a local area network.

‘Reely’ powerful. SuperMac Technology demonstrated VideoSpigot (\$499) and VideoSpigot Pro (\$1,899), QuickTime-compatible motion video frame grabbers for the Macintosh LC and IIsi systems. Each of these will be bundled initially, at no extra charge, with ReelTime, a powerful digital multimedia editing package. The VideoSpigot products are designed to display full-motion 30-frame-per-second video within a small window.

Later, SuperMac also plans to introduce Digital Film, a JPEG firmware compression package that can capture and display full-screen, full-motion video. Digital Film will be compatible with ReelTime. The two products are a potentially formidable bundle for \$6,000 or so. A minute of compressed video will require something like 22 megabytes using the full-screen Digital Film product (your mileage may vary).

Going nonlinear. ReelTime can perform many of the functions executed by so-called digital nonlinear video editing systems, such as Avid Technology’s and Digital F/X’s Mac-based systems, shown at Digital World, and Editing Machines’ Emc2 MS-DOS-based product. These systems are explicitly marketed for videotape production and are in the \$18,000 to \$100,000 range, including the computer hardware.

Nonlinear editors use compressed video to permit disk-based random access (hence “nonlinear”) video editing, cut-and-paste style. They can represent a video production as parallel “film” clips displayed on a timeline. Sequencing segments, creating composites, inserting transitions and special effects, mixing audio, etc. can be represented graphically by dragging icons and thumbnail frames around the computer screen. Video editing with digital nonlinear editors, in other words, is to traditional linear tape editing what word processing or desktop publishing is to using a typewriter.

A video rough draft. With digital editing, there is no deterioration from each generation to the next, as there is with analog tape. The revision process is relatively painless, and turnaround is instant. Multiple video and audio segments are immediately available on disk without shuttling tapes back and forth, and digital transitions, special effects, graphics and animation can be integrated with digital live-action video.

The quality of video output from the compressed digital files is clearly a limitation of nonlinear editing. As new compression chips are delivered in the coming months, video quality may be upgraded from sub-VHS to industrial level.

Already 'offline.' Traditionally, video editing that does not go back to the source tape is called "offline editing." Offline editing can be invaluable for making creative decisions, getting client feedback, showing proof-of-concept, and generating approval tapes before final production. It is essentially a rough draft mode.

Digital nonlinear editing, because of its flexibility and rapid turnaround but less-than-final-production quality, can already fill this "offline" role well. Nonlinear editing packages can display presentations directly on the computer screen or can convert their digital presentations to analog videotape for such uses. Nonlinear editors also have two methods for going back to the analog source tapes to assemble a final high-quality videotape master. (Neither of these paths is supported by ReelTime, by the way.)

The first method, emphasized by both Avid's and Editing Machines' nonlinear products, is to use the completed digital presentation to generate a machine-readable edit decision list (EDL) automatically, for "online" use on an editing suite at a post-production house. This EDL, a recipe for constructing a master tape from source tapes, automates to some extent the tedious linear tape editing process.

The EDL in control. The second final-production method is to create an EDL for the desktop system itself, which then controls source and record decks in order to "auto-assemble," as it is called, a video product. Auto-assembly on the Mac is the recommended method of creating a master tape with the Video F/X system from Digital F/X.

Two systems shown at Digital World exemplify a nondigitized alternative for auto-assembling tapes. Both HSC's MS-DOS-based SantaFe Video Editor (bundled with hardware, not sold retail) and Interactive Media Technologies' more elaborate IMTX 8000 media controller box with Mac front end automatically log time codes as segments are defined. (The IMTX 8000 with two device controller boards plus the relevant software costs \$7,995, not including the Macintosh.)

Software then permits the director to sequence the tape segments and special effects with frame accuracy, by editing a list referencing the time codes. The system can either auto-assemble or output an EDL, without ever digitizing the source tapes. While not as flexible and powerful as true nonlinear editing, this approach eliminates the need for extensive data storage.

An expanding presence. It seems likely that the new desktop video products will combine analog and digital techniques for tape editing for the time being and will eventually be widely used. As compressed digital video approaches the quality of industrial videotape, fully digital editing

methods can be expected to prevail in the industrial training and marketing sector first, rather than in low-end consumer applications, where the hardware is too expensive, or in high-end broadcast production, where the quality is inadequate. Simultaneously, motion video windows are likely to become common in desktop computer presentations and applications.

Bernard Banet

ETHERNET OVER CO-AX CABLE

DEC shapes a community multimedia network, but it ain't no MTV

Anyone who has ever installed an Ethernet-based LAN has noted the more than passing resemblance between thin Ethernet coaxial cable and cable TV coax. True, the stuff used to wire offices is a much higher grade than what the cable companies use to bring MTV into your home, but it is at least from the same genus, if not species.

Several members of Digital Equipment Corp.'s Advanced Development Group made the connection between cable TV and Ethernet wiring and invented Ethernet via Cable Television (ETV). We spoke with Jim Albrycht, senior consultant with the group, who gave a presentation on ETV at the Digital World conference last month.

'Ethernet everywhere.' The concept is that Ethernet can be piggybacked on cable TV wiring to provide Ethernet network services to anyone connected to an "online" cable TV system. All that is required to get an ETV service off the ground is a little Vax computer with communications software to connect to your host computer—wherever that is—and appropriate Ethernet modems at the cable head-end, attached to each PC in each building or home that's online. Once the switch is flipped, users can share files and network services just like those attached to genuine thin Ethernet cabling (or 10BaseT, or thick cable) at the host site—at the full 10-megabit-per-second speed of Ethernet.

According to Albrycht, ETV was the result of DEC's search for a better mode of data communications for employees working at home. DEC has always been a strong believer in "home" computing, with early employees taking home VT52s and VT 100s—and even the ill-fated Rainbow—to telecommute in the evenings, on weekends, or on snowy days. As one of the early pioneers in popularizing Ethernet, DEC felt it was uniquely positioned to "reinvent" it.

A LAN waiting to happen

ETV reinvents Ethernet by:

- Extending 10-Mbps Ethernet from two cable kilometers to 56 cable kilometers (35 cable miles);
- Fitting into and between any standard 6-MHz TV channel;
- Seamlessly bridging the data center, the campus, and the community; and, not coincidentally,
- Opening up the full 100-plus million cable TV-wired U.S. dwellings to DEC's network services.

As specified, ETV is simply an expansion of the local network's domain from the workgroup to the community. Indeed, it is distributed computing to the nth degree; it extends high-bandwidth

Ethernet services to a community-wide domain. With 85 percent of the country wired (to the curb) via cable TV, the cable network is what you might call “a LAN waiting to happen.”

Win-win-win. As DEC sees it, ETV is win-win-win. The cable TV customer (“remote end user,” in computer terms) wins because he now can access his data files and applications at Ethernet speeds rather than dial-up telecom speeds. The cable TV operator wins because he has an additional, two-way service that generates far more revenue per subscriber than he can normally get (generally by a factor of 10 or more over usual cable TV rates). And DEC wins because, well, go figure—if ETV takes off, it could mean the sale of many little Vaxes, Ethernet modems and other DEC software and gear.

Although DEC is, quite naturally, drawing the flow diagrams with its own equipment plugged in, there is no reason why anyone couldn’t build an ETV system. Off-the-shelf technology to connect Ethernet to cable TV systems is available from a variety of vendors. DEC’s value-added is its strong Ethernet connectivity expertise and a pre-existing product suite that plugs together seamlessly, offering one-stop shopping for any company trying to get into ETV in a hurry.

Who needs CNN? ETV is only part of the story, however. DEC’s Advanced Development team sees it as one step in the road toward making a “Community Multimedia Network” (CMN) a reality. The idea behind CMN is to provide an “online, anytime” alternative to telephone-based information services such as Prodigy, taking advantage of the flexibility offered by cable TV’s 24-hour-a-day availability. Via ETV, more than one data network can be made available to an end user, providing the capability for multiple entities to provide information online within a community.

The idea here is that there should be no change in the way people work—the same tools would be available—but such a system would vastly increase an individual’s flexibility to work whenever and wherever appropriate.

The worldwide day. With CMN also comes the notion of a “worldwide day,” which addresses the problem of telecommuting on an international scale. At any given point in time one-third of the world is working, one-third is asleep and one-third is somewhere in between. Using satellite links and other technology common to the cable and telecommunications industries, it’s possible to extend the ETV network beyond current geographical limits, effectively time-shifting one’s workday and enhancing the ability to carry on international business.

This paradigm is appropriate not only for the corporate community, but also for academia, medical establishments, the publishing industry, etc.

Moreover, the high bandwidth of Ethernet makes it possible to include multiple media in the data stream being sent down the wire—indeed, DEC’s own Compound Document Architecture (CDA) supports a variety of data types, including still and moving video and sound. Down the pike, DEC envisions user-defined programming, intelligent information filters, and peer-level automated agents, all run on an ETV network to make computing life easier and to provide a variety of interactive services.

TV, you’re no MTV. It’s important to realize, however, that ETV is simply the infrastructure required for providing these services. Content, or programming, is still a function of the host to

which the user is connected. Think of the networked PC or Mac in your own office. What you see and get there, you would also see and get at home—but at 10-Mbps Ethernet, rather than 2,400-or 9,600-bps dial-up speeds. Still, the hard part is thinking up innovative interactive multimedia services that make sense to run over networks. In cable TV terms, ETV is the wiring protocols that bring such shows as MTV into your home; it isn't MTV itself.

But ETV represents a breakthrough because it liberates data communications from the bottleneck of Ma Bell's slow dial-up phone lines at a cost that is on par with Ma Bell's rates. It is also available today, which means that information providers and corporations don't have to wait for digital telephony like ISDN to arrive to start enjoying some of its promised benefits.

Craig Cline

THEY'RE OFF!

It's a three-way race for audio standards: DAT v. DCC v. Mini Disc

A few years ago, Sony unleashed Digital Audio Tape on the world. Technologically, DAT was wonderful. But Sony mismarketed the product as a way to copy CDs and incurred the enmity of nearly all the major recording companies.

Trapped between a powerful lobbying campaign and a total dearth of prerecorded tapes, Sony was unable to bring DAT to the U.S. market. Philips took advantage of Sony's fumbling, and developed a competing product called Digital Compact Cassette. While technologically inferior to DAT, DCC is compatible with existing analog cassette tapes and, even more important, it has the endorsement of the music industry.

Remember the Betamax! The whole thing is reminiscent of the contest in the VCR world a dozen years ago between Sony's Beta tape format (which offered higher quality) and JVC's VHS format (which had longer playing time). Consumers preferred quantity over quality, so VHS won out.

It looks as though the same thing will happen again. Quality (in this case DAT) will lose out to quantity—the titles that the studios have already promised will accompany DCC's debut.

But wait! It may not be over yet. Sony, having pretty much admitted that DAT isn't going to make it as a consumer product, is trying again with the Mini Disc. Based on the specs, its quality is lower than both DAT's and DAT's. That alone won't make it a winner; the quantity factor depends on whether the record companies go for it. If they do, it will be VHS vs. Beta all over again.

DAT takes on the music industry

When Sony announced DAT a few years ago, audiophiles were enthusiastic. Digital tape, they said, would combine the quality of a CD with the malleability of a recordable medium, letting consumers record their own entertainment, combine selections from different discs and so on. It would also provide CD-quality sound in cars and while jogging, because a tape is much less disturbed by vibration than a CD player. Computer makers looked forward to gigabytes of cheap data storage as a spinoff from the consumer market.

Yo-ho-ho and a dubbing deck. The U.S. music publishing industry, though, reacted with horror. The problem of bootlegging was already bad enough with analog cassette tapes, said industry leaders. But analog tapes didn't sound as good as CDs—they have hiss and noise, the high-frequency response isn't as good—and a second-generation copy of an analog tape sounded worse. So there was some built-in limit to the number of copies of copies that could be made. In fact, a bootleg tape could even sound so bad as to be an incentive to buy the original recording.

Digital tape had no such limits; each copy would be a perfect CD-quality reproduction, thanks to error-correcting codes. The studios said DAT would encourage unlimited pirating of CD music, depriving artists and producers of their lawful revenue. And before DAT products could be developed for the U.S. market, the recording industry began a fierce lobbying campaign in Congress to keep DAT out of the country.

The only reason the campaign never resulted in legislation was that Sony and its licensees decided that discretion was the better part of valor and declined to import consumer recorders. Some “professional” recorders were sold (a few, no doubt, to pirates), but a mass market never developed.

SCMS, the mollifier. The studios relented only when DAT vendors developed the Serial Copy Management System and promised to put an SCMS chip into every consumer-market recorder. SCMS allows you to copy a CD to tape, but it prevents “serial copying,” that is, copies used to make other copies. It represents a compromise between the legitimate desire of record companies to maximize royalties by preventing all copying and the equally legitimate desire of consumers to take advantage of their recorders' abilities.

SCMS is not the end of the argument, however. The music studios are still trying to get Congress to put a tax on recorders and blank tapes, to be funneled back to a royalty pool shared by all copyright owners. This scheme first arose from the U.S. Supreme Court's Betamax decision, and despite minor grumbling, it has worked tolerably well in the video world. The arguments would be the same in the audio world.

No titles. The studios' opposition took one more form, just as deadly: they refused to publish albums on digital tape. (By one industry estimate, there are even now no more than 200 commercial titles worldwide.) This strategy scotched the demand for DAT recorders; outside of a tiny hobbyist market segment, few people would pay just to splice selections from CDs.

You've heard of the chicken-and-egg problem: hardware makers won't tool up to enter a market unless there is software to stimulate demand, but software folks won't develop titles unless there is an installed base of hardware. Well, the recording studios tried both to strangle the chicken and to cook the egg.

Still wide open. The upshot is that even though DAT was introduced nine years ago, it is still struggling to gain any momentum in the U.S. consumer marketplace. DAT has found some specialized applications in computer backup and in-the-field recording, but otherwise it has remained pretty much a hobbyist's gadget. It may become a commercial success in some niches, but the audio mass market is still wide open.

DCC enters the maelstrom

Last January, Philips threw its own hat into the digital-recording ring. It announced a new tape format, called Digital Compact Cassette (DCC), and positioned it as the natural successor to the standard audio cassette. (Not incidentally, Philips was also the developer of the cassette.) The first products will begin appearing sometime in 1992.

In announcing DCC, Philips took great care to avoid the mistakes Sony made with DAT.

Support of the music industry. Philips says that it involved representatives from the record companies at an early stage in the design of DCC. At the product announcement, Philips had already lined up endorsements from PolyGram (which Philips owns), Capitol-EMI and the German entertainment conglomerate BMG. These firms will release a range of titles, timed to arrive in the stores when the recorders do. In contrast, not even Sony Music Entertainment (the former CBS Records) endorsed DAT.

Copy protection. No law requires the SCMS copy protection scheme; the manufacturers are building it into consumer DAT recorders “voluntarily.” The music industry must remain ever vigilant against vendors that try to cut costs by quietly dropping the extra circuitry that it entails. But Philips has embedded SCMS in its DCC data-format standard. Thus, every DCC machine will necessarily have SCMS, assuaging the fears of copyright owners.

Existing software. A DCC tape drive can play today’s analog audio cassette tapes. Both the physical dimensions of the drive and the mechanics of the read/write head are compatible with existing tapes. The player uses separate electronics for analog and digital tapes, but that adds little to the manufacturing cost—an extra chip or two.

Philips notes that the average U.S. family owns some 60 prerecorded cassettes. There are about 25,000 titles available, and total worldwide sales exceed 1.5 billion cassettes each year.

The sound quality of existing analog tapes will, of course, be no better on a DCC player than on any other player. To make sure that it is no worse, Philips plans to include Dolby noise reduction circuits in the analog playback section of its first DCC products.

On the other hand, you can’t play a DCC tape in an analog cassette player. Digitally coded data is pure noise to analog circuits. Besides, the casing won’t fit.

Shirt-pocket size. A DCC cassette is almost the same overall size and shape as a standard audio cassette. The holes in the casing for the motor spindles and the read/write heads are protected by a sliding metal cover (similar to the shutter on a 3.5” floppy disk) that keeps dirt and fingerprints away.

Neat features. The cover is flat, so it can easily be printed with album graphics. Philips says this design makes it easy for a motorist to pick the right tape without taking his eyes off the road for more than a second. Even more important (to retailers, anyhow, not to safety advocates) is how the product looks on display on store shelves.

Prerecorded digital tapes will have a table of contents that lets the drive fast-forward to any selection on the tape. Just as you can now do with CD players, you'll be able to program a DCC player to play selections in any order, replay favorite cuts and so on.

It is also possible to pack some extra information with the audio. At the Consumer Electronics Show, a Philips player had an LCD display that showed the lyrics of a song as it was being played.

At first, 90 minutes. The first tapes on the market will have a playing time of 90 minutes. Actually, that's two sides of 45 minutes each, but auto-reversing is a standard part of DCC drives, so the hiatus at turnaround will be less than one second. The DCC specification provides for increasing the playing time to 60 minutes per side.

DAT has an advantage here: it already delivers 120 minutes of sound, uninterrupted, in standard recording mode.

Prices and licensees. Tandy has announced that it is Philips's first DCC licensee. Matsushita is also believed to have a license, though official Philips statements refer only to "a large Japanese manufacturer." Philips stated that it would offer DCC manufacturing licenses to all interested parties, just as it did with CD years ago.

No recorder prices will be announced until products start appearing next year. However, Philips notes that most of the technology on which DCC rests is a simple extension of current audio cassette manufacturing techniques. The only novel component is the read/write head, which uses integrated thin-film technology pioneered by the Winchester disk makers. Thus, machine prices in the range of \$500 to \$600 are likely for the first year. Prices should fall rapidly as manufacturing volume rises.

As to media cost, DCC uses the same formulation as VHS videotapes. It is the same width as current analog cassette tape, so manufacturing DCC cassettes is just a matter of putting the right material into existing slitting machines. Unlike DAT, DCC tapes are amenable to high-speed duplication. Therefore, prerecorded albums are likely to be priced somewhere between analog cassettes and CDs.

Minor problems. As with any tape, DCC's access time is limited by the fast-forward or rewind speed. The tape will take lots longer to seek to the desired track than a CD player. In addition, the data rate coming off the tape is too low to be interesting to the computer industry, so don't expect to see any spinoff benefits here.

On the other hand, DCC does a lot of things right: it works with your old tapes, the record companies will be issuing new digital tapes, a strong retailer is backing it and the expected prices are right for the consumer market. Even before any products have arrived, it looks as though DCC has already sounded a death knell for DAT.

Sony tries again with Mini Disc

As reported last month, in mid-May Sony announced a new optical disc format, a mere 2.5 inches in diameter, that supports both recordable discs and CD-like prerecorded discs. The Mini

Disc (MD) is clearly designed to displace cassette tape in Walkman-style portables, boom boxes and car stereos.

Another disc size? Sony's market research shows that consumers rarely use CDs in cars or while jogging. For one thing, the size of the disc makes for a much larger player than a Walkman. For another, CD players have an annoying tendency to skip tracks when jostled; cassette tape is nearly impervious to jolts. In addition, tapes are recordable, allowing users to assemble their favorite tunes onto one tape. On the other hand, consumers are enthusiastic about a CD's sound quality and its ability to go instantly to any selection.

Sony believes that MD is the answer to all these requirements. It's much smaller than a cassette, yet holds exactly as much music as a CD. Being a disc, it can jump to any selection in less than a second. Like tape, it's recordable. And like tape, it's just about immune to vibration.

How Sony did it. Two substantial innovations make these advantages possible.

The first is a low-power optical disc technology that will allow battery operation. In addition, the MD drive will work with both pre-recorded polycarbonate discs (essentially 2.5" CDs) and user-recordable, rewritable magneto-optical discs.

The second is a data compression scheme that gives roughly a 5:1 compression ratio. Sony calls its scheme Adaptive Transform Acoustic Coding (ATRAC). Like the PASC compression used on Philips's DCC (see box on page 21), the scheme takes advantage of the human ear's limitations and sensitivities. This packs the music into a smaller space. But it also lets the laser "get ahead" of the listener.

The player can pull data off the disc at the same speed as a CD—1.4 Mbits per second—but the ATRAC decoder only needs to be fed 0.3 Mbits per second. By putting an ordinary one-megabit memory chip between the laser and the decoder, Sony creates a three-second reservoir of data. If vibration causes the laser to skip a track, it has plenty of time to find its way back and refill the pipeline.

Perfection not desired. MD sound quality is nearly as good as a CD; most people probably won't be able to tell the difference. (The perfectionists who can are probably already using DAT, anyway.) But Sony makes no bones that it isn't the real thing. This may actually help Sony's efforts in gaining acceptance of the new format; the record companies don't really want a recordable medium that allows perfect copies. Naturally, Sony's MD player will also have SCMS copy protection.

What's the price tag? Sony hasn't said much about the cost of Mini Disc recorders. Based on what Sony has said about the technology, outsiders have estimated that a MD device will be twice as expensive to make as a DCC tape recorder. Assuming that Sony applies the same markup formulas as Tandy, that puts the first MD recorders into the \$800 to \$999 range.

But Sony has said that the first recorders will not appear until the end of 1992. That gives it more than a year to figure out how to cut costs. It also will put product into the stores almost a year later than DCC. Maybe Sony will be willing to cut margins in order to make up for lost time and market share.

As to the media, the same outsider estimates the cost of blank discs at the high end of today's quality tape prices. Considering the quality improvement, we think consumers will cheerfully pay that premium.

Cost difference. Prerecorded MD discs use the same materials and technology as CDs and can be stamped out on the same machines. (The bits on the disc are coded differently, but that's a one-time automatic conversion.) So there's scant manufacturing cost differential.

The packaging for both media (and for DCC tapes, for that matter) is governed by store display requirements—no matter how tiny the product, the package must be big to make shoplifting harder—and so distribution costs such as handling and shelf space will run about the same. All of which means that retail prices for music discs will probably be the same as for DCC tapes: somewhere between analog tapes and CDs.

Where's the software? So far, only Sony Music Entertainment has endorsed MD. Whether the other studios get on the bandwagon depends on whether Sony can convince them there is room in the market for yet another format. And that's not at all obvious right now. Sony will have to do a lot of politicking to get the MD ball rolling.

The days of analog are numbered

The one thing that seems pretty obvious is that the days of analog tape are numbered, no matter whether it is DCC or MD that takes its place. Consumers have already shown that they will pay for CD-quality sound, and that they want the convenience and portability that cassette tapes grant today.

At the moment, it looks as though Sony will have a hard time establishing MD in the market. It's doubtful that consumers will buy two alternatives to their CD players. DCC will get to market first, at a lower price point and able to play your favorite old analog tapes. Several music publishers have already promised a hefty number of titles for release with the first players.

Lots of ifs. MD's technical advantages are that it is smaller than a cassette, allowing a smaller Walkman-style player; that it offers much better random (nonsequential) access; and that it is ideal for multidisc "jukebox" players. But the smaller size is a mixed blessing; it will be harder to find what you're looking for in a pile of discs, because there's less room for labeling on the edge of the shell.

But we aren't willing to write MD off before the fight begins. If Sony can garner more endorsements from the music publishers and sign up second-source manufacturers who will broaden the range of price-performance, and if these manufacturers together can create a bandwagon effect, there's hope.

Peter Dyson

A PRIMER ON DIGITAL AUDIO

Digital audio tape recorders use the same helical-scan recording principles as video recorders do. During playback or recording, the tape winds around a large drum at a slight angle. Inside the drum, one or more read/write heads spin horizontally; each head writes a stripe across the tape as

it swings by. Because the tape is at an angle to the drum, the stripe runs diagonally across the tape.

However, unlike videotape, DAT information is organized into discrete sectors, much like a floppy disk. Some of the sectors hold synchronizing and control information, including the SCMS copy protection bits, but most of them hold digitally coded music.

Even though the general principle is the same as videotape, DAT is not particularly compatible with any other existing format. The width of the tape, the size of the case, the speed past the recording drum, the tape-to-drum angle and the sector layout combine to make DAT unique.

DCC is completely different. One of Philips's goals in developing DCC was compatibility with existing tapes. That requirement dictated fixed-position read/write heads. Cramming in all the bits needed for CD-quality sound, while keeping the same size tape and running it at the same speed as an analog cassette, is possible by virtue of two innovations.

First, digital information is recorded in nine tiny subtracks (eight for music and one for control) side by side down the length of the tape. DCC uses integrated thin-film heads, a semiconductor technology adapted from hard disks. Both the electronic and magnetic components are etched onto a silicon wafer in much the same way that computer chips are made. There are actually two complete sets of heads, one for analog playback (but not for recording) and another for digital recording and playback, integrated onto the chip.

Second, the data is compressed and decompressed on the fly. Philips calls its scheme Precision Adaptive Subband Coding and claims that it offers a 4:1 compression ratio. This compression method is fine-tuned to the characteristics of the human ear; although the actual data rate coming off the tape is much less than a CD provides, Philips says the perceived quality of sound is every bit as good.

Will the Computer Industry Buy In?

Thinking about the Mini Disc, we can't help wondering whether the computer industry will adapt it for laptop and notebook computers the way CD-ROM was adapted from the audio CD format. As with CD-ROM, the computer industry will probably wait to see if MD is a success in the consumer market, which allows low prices in the computer industry.

On the plus side:

- MD holds about 100 megabytes. For some applications, that's plenty; lots of today's CD-ROMs do not use anywhere near the 550 MB that is available on a 5" disc.
- Mini Disc could be a suitable substitute for the 44-MB removable Winchester disks that make portable many of today's multimedia presentations.
- Existing CD-ROM mastering and stamping systems (which are derived from audio CD) could easily be adapted.
- A disc weighs about half an ounce; drives would probably weigh less than today's 3.5" floppy drives.
- Data transfer rate is similar to a CD-ROM's; with suitable compression devices, even motion video could be played from the disc.

On the minus side:

- Slow access times, comparable to a CD, mean the Mini Disc will be unsatisfying as the computer's primary storage device.
- IBM is aggressively marketing a new, computer-ready 3.5" magneto-optical disc drive to computer makers and retailers. (See news story, page 12.) Sony will have its own entry in this arena.
- A Mini Disc can hold 100 or so MB, which means that very little video, and not all that many stills, could fit on a disc.

Will the computer industry buy in? For one view, see the letter on page 2.

EVENTS

SIGGRAPH

July 28-Aug. 2, Las Vegas, NV

ACM-SIGGRAPH

(212) 752-0911

Annual meeting of the graphics group of the Association of Computing Machinery (ACM), and one of the industry's most stimulating shows. Once a "specialty" exhibition, SIGGRAPH is becoming a hot spot for an increasing number of digital media and multimedia products.

Macworld Expo

Aug. 6-9, Boston, MA

Mitch Hall Associates

(617) 361-8000

Everyone goes, even though no one can quite figure out why it's *still* in Boston in the dead of summer. System 7 and QuickTime demonstrations and applications will abound.

European Technology Roundtable Exhibition (ETRE)

Sept. 12-14, Opio, France

Dasar, Inc.

(415) 321-5544

This year's theme is "Technology and the New Europe," and a full series of roundtables with the industry's most influential leaders will explore topics from microprocessors to consumer electronics. A great boondoggle to the French Riviera.

Seybold Computer Publishing Conference + Expo

Oct. 1-4, San Jose, CA

Seybold Seminars

(213) 457-5850, fax (213) 457-4704

The annual "must attend" event in computer publishing and graphics, with an increasing emphasis on digital media and electronic publishing. It's the largest and most influential show of its type.

International TAPE (Technology, Aesthetics, Politics and Education/Entertainment) Symposium

Oct. 16-18, San Rafael, CA

Dominican College Academy of Professional Development
(415) 485-3255

Celebrating its 100th anniversary and the 100th anniversary of film, Dominican is sponsoring this symposium for media professionals, technologists, business leaders, artists and scholars with an eye toward the 21st century. Dominican College also plans to launch a new multimedia curriculum in conjunction with TAPE.